

## **REMARKS**

In response to the above-identified Office Action (“Action”), Applicant submits the following remarks and seeks reconsideration thereof. In the instant response, claims 1 and 13 are amended, no claims are added and no claims are cancelled. Accordingly, Claims 1, 3 and 5-14 are pending.

The instant application is directed to a composite polymer electrolyte for a lithium secondary battery, which comprises a first polymer matrix made of a first porous polymer with a first pore size, wherein the first porous polymer is polyethylene, polypropylene, polyimide, polysulfone, polyurethane, polyvinylchloride, cellulose, nylon, polyacrylonitrile, polyvinylidene fluoride, polytetrafluoroethylene, a copolymer or blend thereof, and wherein the first polymer matrix does not comprise a polymer type single ion conductor, a second polymer matrix coated on the first polymer matrix and made of a single ion conductor consisting essentially of polymer, an inorganic material, and a second porous polymer with a second pore size smaller than the first pore size, wherein the second porous polymer is a vinylidene fluoride based polymer, an acrylate based polymer, a copolymer or a blend thereof, and wherein the second polymer matrix has an ionic conductivity equal to or higher than the ionic conductivity of the first polymer matrix; and an electrolyte solution impregnated into the first polymer matrix and the second polymer matrix.

### **I. Claim Amendments**

Claims 1 and 13 are amended to clarify that the first polymer matrix does not include the polymer type single ion conductor and the second polymer matrix is made of a single ion conductor consisting essentially of polymer and has an ionic conductivity equal to or higher than the ionic conductivity of the first polymer matrix. Support for the amendments may be found, for example, in Example 7 and Figure 3 of the application. Thus, the amendments are supported by the specification and do not add new matter. In view of the foregoing, Applicant respectfully requests consideration and entry of the amendments to claims 1 and 13.

### **II. Claim Rejections – 35 U.S.C. §102(e) and §103(a)**

In the outstanding Action, claims 1, 3, and 5-14 stand rejected under 35 U.S.C. §102(e) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Munshi, (“Munshi”), U. S. Patent No. 6,645,675. Applicant respectfully traverses the rejection for at least the following reasons.

It is axiomatic that to anticipate a claim, every element of the claim must be disclosed within a single reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Moreover, to establish a *prima facie* case of obviousness, the Examiner must show that the cited reference teaches or suggests each of the elements of a claim. Hindsight reconstruction may not be used to modify the reference to meet the claimed invention. MPEP §2145.

In regard to independent claims 1 and 13, Applicant respectfully submits Munshi fails to teach or suggest at least the elements of a first polymer matrix made of a first porous polymer with a first pore size and **a second polymer matrix coated on the first polymer matrix** and made of a single ion conductor, an inorganic material, and a second porous polymer with a second pore size smaller than the first pore size and an electrolyte solution impregnated into the first polymer matrix and the second polymer matrix as required in claims 1 and 13. That is, the first polymer matrix and the second polymer matrix are two separate films stacked in order of their pore sizes. Moreover, Munshi fails to teach or suggest a first polymer matrix does not include the polymer type single ion conductor and the second polymer matrix is made of a single ion conductor consisting essentially of polymer and has an ionic conductivity equal to or higher than the ionic conductivity of the first polymer matrix as recited in the amendments to claims 1 and 13. The distinction between these two films is further clarified by the prior amendments to claims 1 and 13 in which it is recited that the composite polymer electrolyte comprises a first polymer matrix made of a first porous polymer wherein the first porous polymer is made of polyethylene, polypropylene, polyimide, polysulfone, polyurethane, polyvinylchloride, cellulose, nylon, polyacrylonitrile, polyvinylidene fluoride, polytetrafluoroethylene, a copolymer or blend thereof and a second polymer matrix made of a second porous polymer wherein the second porous polymer is made of a vinylidene fluoride based polymer, an acrylate based polymer, a copolymer or a blend thereof. Applicant's specification discloses that the composite polymer matrix structure comprised of porous polymer matrices of different pore sizes as described above results in excellent ionic conductivity due to the single ion conduction-containing porous polymer matrix. See Application, page 5, lines 1-5.

The Examiner alleges Munshi teaches a first porous polymer is polyvinylidene fluoride (col. 6, lines 35-45) and a second polymer is a vinylidene fluoride based polymer (col. 7, lines 1-

5) impregnated by an electrolyte solution (col. 6, lines 29-64, Examples 1-5). See Action, page 3. The Examiner admits Munshi does not teach a second polymer having a second pore size smaller than the first pore size of the first polymer. See Action, page 4. Moreover, the Examiner has not pointed to a portion of Munshi teaching “a second polymer matrix coated on the first polymer matrix” as required by claims 1 and 13. Applicant respectfully submits, the Examiner’s failure to identify a portion of the reference teaching each of these elements alone, prevents a finding of anticipation based on the reference.

Upon review of the reference, it is clear the Examiner’s failure to point to a portion of the reference teaching “a second polymer matrix coated on the first polymer matrix” is due to the fact that this element may not be discerned from Munshi. Munshi teaches a solid polymer electrolyte comprising a base polymer material comprising at least two polymers. As illustrated in the figures and discussed in the specification, the base polymer material of Munshi forms a single layer, i.e. a thick layer of a solid polymer electrolyte 70. See Munshi, col. 25, lines 37-40; col. 26, lines 12-15 and Figures 1B, 2 and 3. Even examples 1-5 and other embodiments of Munshi do not teach or suggest a first polymer matrix made of a first porous polymer with a first pore size and a second polymer matrix coated on the first polymer matrix wherein a second porous polymer of the second matrix has a second pore size smaller than the first pore size. See Munshi, cols. 18-20. In fact, Munshi does not even contemplate the coating of one polymer onto another or that the use of polymers having different pore sizes may provide any sort of advantage to the invention. Certainly a mixture of two polymers which is cast to form a sheet material may not be characterized as a second polymer matrix coated on a first polymer matrix.

In addition, Applicant respectfully disagrees with the Examiner’s indication that col. 6, lines 29-64 and Examples 1-5 teach the element of “an electrolyte solution impregnated into the first polymer matrix and the second polymer matrix.” The portions of the reference cited by the Examiner teach the formation of a mixture including a polymer, lithium salt, filler and ion conducting material which is then cast as a sheet material to allow the solvent to evaporate. Nowhere within this portion of the reference is the mixture characterized as including a first polymer matrix and a second polymer matrix much less an electrolyte solution for impregnating polymer matrixes within the mixture. Certainly the mere mixing of a polymer with a lithium salt may not be characterized as “an electrolyte solution impregnated into the first polymer matrix

and the second polymer matrix” wherein the second polymer matrix is coated on the first polymer matrix as required by claims 1 and 13.

Moreover, Munshi does not teach the elements of a first polymer matrix which does not include the polymer type single ion conductor and the second polymer matrix made of a single ion conductor consisting essentially of polymer and having an ionic conductivity equal to or higher than the ionic conductivity of the first polymer matrix as recited in the amendments to claims 1 and 13. Munshi states “in some embodiments of the solid polymer electrolyte the second polymer is more inert with respect to ionic conductivity and is stronger than the first polymer when each polymer is in the form of a thin film.” See Munshi, col. 6, line 65 to col. 7, line 1. Munshi further states “a preferred base polymer material for making a room temperature highly conductive solid polymer electrolyte contains a hybrid copolymer solid-solution homogenous blend of at least two polymers one selected from a group having pronounced ionic conductivity, and the other selected from a second group consisting of polymers which are non-ionically conductive.” See Munshi, col. 14, lines 11-17. Munshi, however, does not teach or suggest a second polymer matrix having an ionic conductivity equal to or higher than the ionic conductivity of the first polymer matrix. Munshi further discusses single ion conductors made of polymer. See Munshi, col. 14, lines 45-50. However, the single ion conductors made of polymer are not for the second group polymer, but for the first group of polymers. See Munshi, col. 14, lines 10-64. In other words, Munshi does not teach or suggest the first polymer matrix which does not include a polymer type single ion conductor and the second polymer matrix made of a single ion conductor consisting essentially of polymer as further recited in amended claims 1 and 13.

Thus, for at least the foregoing reasons, the Examiner has not established that Munshi anticipates claims 1, 13 and their dependent claims.

Moreover, these elements are not *prima facie* obvious in view of Munshi. The Examiner alleges as evidenced by OEM GE PVDF Transfer Membranes and Small Parts, Inc., pore sizes of PVDF may range from 0.22 to 0.45 micron and polyethylene may range from 10-120 microns therefore the element of a second porous polymer with a second pore size smaller than the first pore size of the first polymer is obvious. See Action, page 4. The Examiner, however, still fails to address where within the reference the additional element of coating of the second polymer

matrix on the first polymer matrix is taught or suggested. Instead, the Examiner merely points to portions of Munshi allegedly teaching the polymer in the form of a thin film, for example, col. 6, lines 65-67-col. 7, line 1. Applicant respectfully submits a mere notation in the reference that the polymer may be in the form of a film falls far short of teaching or suggesting coating a second polymer matrix on a first polymer matrix wherein a second porous polymer of the second matrix has a second pore size smaller than the first pore size.

Moreover, as previously discussed, Munshi teaches nothing with respect to the pore sizes of the listed polymers much less selecting a second porous polymer having a smaller pore size than a first porous polymer in constructing the described electrolyte. Accordingly, even if the pore sizes of the listed polymers may vary, Munshi does not teach or suggest coating a first polymer matrix with a second polymer matrix wherein the second polymer matrix includes a second porous polymer having a second pore size smaller than a first pore size of a first porous polymer of the first polymer matrix as recited in claims 1 and 13.

Moreover, the Examiner's reliance on teachings from OEM GE PVDF Transfer Membranes and Small Parts, Inc., which recite pore sizes of PVDF from 0.22 to 0.45 micron and polyethylene from 10-120 microns does not render the claimed pore size range obvious for at least the reason that the relied upon materials are inconsistent with those of Munshi pointed to by the Examiner. In particular, the Examiner relies upon a first polymer of Munshi as PVDF and a second polymer as a vinylidene fluoride based polymer in rejecting the claims, not the combination of PVDF and polyethylene. Moreover, the first polymer, PVDF, relied upon by the Examiner appears to have a smaller pore size than the second polymer, polyethylene, thus even if PVDF as a first porous polymer and polyethylene as a second porous polymer are selected, the combination would not teach or suggest a second porous polymer (polyethylene) having a smaller pore size than the first porous polymer (PVDF) as is required by claims 1 and 13.

For at least the foregoing reasons, Munshi fails to teach or suggest all the elements of claims 1 and 13. Thus, neither anticipation nor a *prima facie* case of obviousness may be established. In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 1 and 13 under 35 U.S.C. §102(e) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Munshi.

In regard to claim 8, claim 8 depends from claim 1 and incorporates the limitations thereof. Thus, for at least the reasons discussed in regard to claim 1, claim 8 is not anticipated by, or obvious over Munshi. Claim 8 is further patentable over Munshi for at least the reason that Munshi fails to teach or suggest the additional element of the first polymer matrix has a thickness of 10 to 25  $\mu\text{m}$  and the second polymer matrix has a thickness of 0.5 to 10  $\mu\text{m}$  as recited in claim 8. The Examiner alleges col. 7, lines 19-22 and col. 22, lines 8-10 teach a polymer matrix thickness of 2-100 microns. Applicant respectfully submits these portions of Munshi teach a thickness of the solid polymer electrolyte, not a first polymer matrix and a second polymer matrix with different thicknesses. Moreover, a broad thickness range of from 2-100 microns does not disclose the two separate claimed ranges of 10-25 microns and 0.5-10 microns with sufficient specificity and therefore does not anticipate the claimed range. See MPEP 2131.03(II) "PRIOR ART WHICH TEACHES A RANGE WITHIN, OVERLAPPING, OR TOUCHING THE CLAIMED RANGE ANTICIPATES IF THE PRIOR ART RANGE DISCLOSES THE CLAIMED RANGE WITH "SUFFICIENT SPECIFICITY."

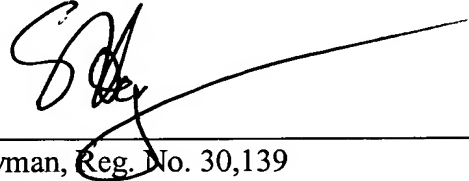
In regard to claims 3, 5-7 and 9-12 and 14, claims 3, 5-7 and 9-12 depend from claim 1 and claim 14 depends from claim 13 and incorporate the limitations thereof. Thus, for at least the reasons that Munshi fails to anticipate, or in the alternative render claims 1 and 13 obvious, claims 3, 5-7 and 9-12 and 14 are also not anticipated or obvious in view of Munshi. In view of the foregoing, Applicant respectfully requests reconsideration and withdrawal of the Examiner's rejection of claims 3, 5-7 and 9-12 and 14 under 35 U.S.C. §102(e) as being anticipated by, or in the alternative, under 35 U.S.C. §103(a) as obvious over Munshi.

### CONCLUSION

In view of the foregoing, it is believed that all claims now pending, namely claims 1, 3 and 5-14, patentably define the subject invention over the prior art of record, and are in condition for allowance and such action is earnestly solicited at the earliest possible date. If the Examiner believes that a telephone conference would be useful in moving the application forward to allowance, the Examiner is encouraged to contact the undersigned at (310) 207 3800.

Respectfully submitted,

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Dated: September 6, 2006

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